DSG4 gene

desmoglein 4

Normal Function

The *DSG4* gene provides instructions for making a protein called desmoglein 4 (DSG4). This protein is found in specialized structures called desmosomes that are located in the membrane surrounding certain cells. Desmosomes help attach cells to one another and play a role in communication between cells. The DSG4 protein is found in cells in certain regions of hair follicles, including the inner compartment of the hair strand (shaft) known as the cortex. Hair growth occurs at the hair follicle when cells divide and the hair shaft is pushed upward and extends beyond the skin.

Desmosomes provide strength to the hair and are involved in signaling between neighboring cells within the hair shaft. The DSG4 protein may play a role in communicating the signals for cells to mature (differentiate) and form the hair shaft. In addition, the DSG4 protein is found in the upper layers of the skin where it provides strength and communicates signals for the skin cells to mature.

Health Conditions Related to Genetic Changes

autosomal recessive hypotrichosis

At least 10 mutations in the *DSG4* gene have been found to cause autosomal recessive hypotrichosis, a condition that results in sparse hair growth (hypotrichosis) on the scalp, and less frequently, other parts of the body. A particular mutation that deletes a piece of genetic material in the *DSG4* gene (written as Ex5_8) is a common cause of the condition in individuals of Pakistani ancestry. This mutation impairs the protein's ability to help cells attach to one another. Other *DSG4* gene mutations result in the production of abnormal DSG4 proteins that cannot communicate signals between cells within hair follicles or skin. As a result, hair follicles are structurally abnormal and often underdeveloped. Irregular hair follicles alter the structure and growth of hair shafts, leading to fragile hair that breaks easily. A lack of normal DSG4 protein function may weaken the skin and contribute to the skin problems sometimes seen in individuals with autosomal recessive hypotrichosis.

monilethrix

Mutations in the *DSG4* gene have been found in people with monilethrix, a hair condition characterized by strands of hair with a beaded appearance. The hair is also short, brittle and breaks easily. The mutations associated with this condition can affect any part of the DSG4 protein, but these changes typically alter the

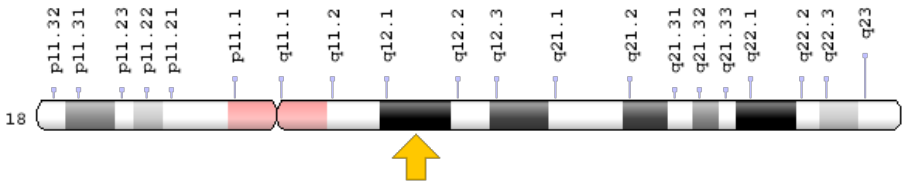
extracellular domain, which is the region of the protein outside the cell that interacts with other cells. In people with monilethrix, the cortex of the affected hair shaft appears abnormal. However, it is unclear how mutations in the *DSG4* gene are related to the abnormality in the cortex or the beaded appearance of the hair.

It is unknown why some individuals with *DSG4* gene mutations develop monilethrix and others develop autosomal recessive hypotrichosis (described above). These conditions may represent different forms of the same disorder.

Chromosomal Location

Cytogenetic Location: 18q12.1, which is the long (q) arm of chromosome 18 at position 12.1

Molecular Location: base pairs 31,376,777 to 31,415,791 on chromosome 18 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- cadherin family member 13
- CDGF13
- CDH family member 13
- CDHF13
- desmoglein-4
- DSG4_HUMAN
- LAH

Additional Information & Resources

Educational Resources

- Molecular Biology of the Cell (fourth edition, 2002): Desmosomes Connect Intermediate Filaments from Cell to Cell
  https://www.ncbi.nlm.nih.gov/books/NBK26857/#A3488

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28DSG4%5BTIAB%5D%29+OR+%28desmoglein+4%5BTIAB%5D%29%29+OR+%28desmoglein-4%5BTIAB%5D%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+2520+days%22%5Bdp%5D

OMIM

- DESMOGLEIN 4
  http://omim.org/entry/607892

Research Resources

- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=DSG4%5Bgene%5D
- HGNC Gene Family: Desmosomal cadherins
  http://www.genenames.org/cgi-bin/genefamilies/set/1188
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=21307
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/147409
- UniProt
  http://www.uniprot.org/uniprot/Q86SJ6

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